OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from **MESSER POND** the program coordinators recommend the following actions.

FIGURE INTERPRETATION

- Figure 1: These graphs illustrate concentrations of chlorophyll-a in the water column. Algae are microscopic plants that are a natural part of lake ecosystems. Algae contain chlorophyll-a, a pigment necessary for photosynthesis. A measure of chlorophyll-a can indicate the abundance of algae in a lake. The historical data (the bottom graph) show a *stabilizing* in-lake chlorophyll-a trend. Chlorophyll concentrations were very low in May and June, and peaked in August. The mean chlorophyll concentration was below the state mean. As nutrients build up in the water column, there can be more algal growth as the summer progresses. The peak in August correlates with an overall higher concentration of phosphorus in the lake at that time. The algae observed in this year's sample are a healthy mix of common algae typically found in New Hampshire's waters. While algae are present in all lakes, an excess amount of any type is not welcomed. Concentrations can increase when there are external and internal sources of phosphorus, which is the nutrient algae depend upon for growth. It's important to continue the education process and keep residents aware of the sources of phosphorus and how it influences lake quality.

- Figure 2: Water clarity is measured by using a Secchi disk. Clarity, or transparency, can be influenced by such things as algae, sediments from erosion, and natural colors of the water. The graphs on this page show historical and current year data. The lower graph shows a *fairly stable* trend in lake transparency. As the chlorophyll concentrations increased throughout the summer the clarity showed decreased until September when it increased slightly. The 2000 sampling season was considered to be wet and, therefore, average transparency readings are expected to be slightly lower than last year's readings. Higher amounts of rainfall usually cause more eroding of sediments into the lake and streams, thus decreasing clarity.

- Figure 3: These figures show the amounts of phosphorus in the epilimnion (the upper layer in the lake) and the hypolimnion (the lower layer); the inset graphs show current year data. Phosphorus is the limiting nutrient for plants and algae in New Hampshire waters. Too much phosphorus in a lake can lead to increases in plant growth over time. These graphs show a *stable* trend for the upper water layer, a *slightly improving* trend for the lower water layer. Epilimnetic phosphorus concentrations fluctuated this season, but mean values were consistent with those of last year's. The elevated concentration in the hypolimnion in July was due to the sample being one meter deeper. At this depth the dissolved oxygen was depleted and can cause phosphorus bound to the sediments to be released into the water column. This might also explain the August results, as dissolved oxygen could have become depleted farther up into the water column. Scheduling a visit later in the summer will allow us to determine if dissolved oxygen will be further depleted in the water column. One of the most important approaches to reducing phosphorus levels is educating the public. Humans introduce phosphorus to lakes by several means: fertilizing lawns, septic system failures, and detergents containing phosphates are just a few. Keeping the public aware of ways to reduce the input of phosphorus to lakes means less productivity in the lake. Contact the VLAP coordinator for tips on educating your lake residents or for ideas on testing your watershed for phosphorus inputs.

OTHER COMMENTS

- Depleted oxygen in the hypolimnion occurred one meter off the bottom in July this season (Table 9). The process of decomposition in the sediments depletes dissolved oxygen on the bottom of the lake. As bacteria break down organic matter, they deplete oxygen in the water. When oxygen gets below 1 mg/L, phosphorus normally bound up in the mud may be released into the water column, a process that is referred to as *internal loading*. Since an internal source of phosphorus to the lake may be present, limiting or eliminating external phosphorus sources in the lake's watershed is even more important for lake protection.

- Inlet conductivity remains high for the lake (Table 6). Conductivity increases often indicate the influence of human activities on surface waters. Septic system leachate, agricultural runoff, iron deposits, and road runoff can all influence conductivity. It would be useful to uncover the reasons for increased conductivity as we continue to monitor the lake. This can be accomplished through watershed walks and stream bracketing.

- Phosphorus concentrations in Brown and Nutter Inlets were elevated in June, July, and August this season (Table 8). Since inlet conductivities have also been high, we suggest bracketing both Inlets next season as a means of pinpointing any sources of pollution. If you would like to bracket your Inlets please contact the VLAP coordinator to schedule a day to do so. Testing when there is sufficient flow for a clean sample and after rains in recommended.

- *E. coli* originates in the intestines of warm-blooded animals (including humans) and is an indicator of associated and potentially harmful pathogens. Bacteria concentrations were low at the sites tested (Table 12). If residents are concerned about septic system impacts, testing when the water table is high or after rains is best. Please consult the Other Monitoring Parameters section of the report for the current standards for *E. coli* in surface waters.

NOTES

- Monitor's Note (5/9/00): Water above normal.
- Monitor's Note (6/11/00): Brown Inlet sample was taken above culvert, not below, as usual. Water flow was not as good as at usual sample site. Meter markings on chain hard to read.
- Monitor's Note (7/11/00): New house being built.
- Biologist's Note (8/8/00): Two E. coli bottles were labeled the same for Beaver House.
- Monitor's Note (9/5/00): No flow at Brown Inlet.

USEFUL RESOURCES

Stormwater Management and Erosion and Sediment Control Handbook. NHDES, Rockingham County Conservation District, USDA Natural Resource Conservation Service, 1992. (603) 679-2790.

Comprehensive Shoreland Protection Act, RSA 483-B, WD-BB-35, NHDES Fact Sheet. (603) 271-3503 or www.state.nh.us

Minimum Shoreland Protection Standards, WD-BB-36, NHDES Fact Sheet. (603) 271-3503 or www.state.nh.us

Beavers and Their Control. UNH Cooperative Extension/NH Fish and Game, 1990. (603) 862-2346, or ceinfo.unh.edu

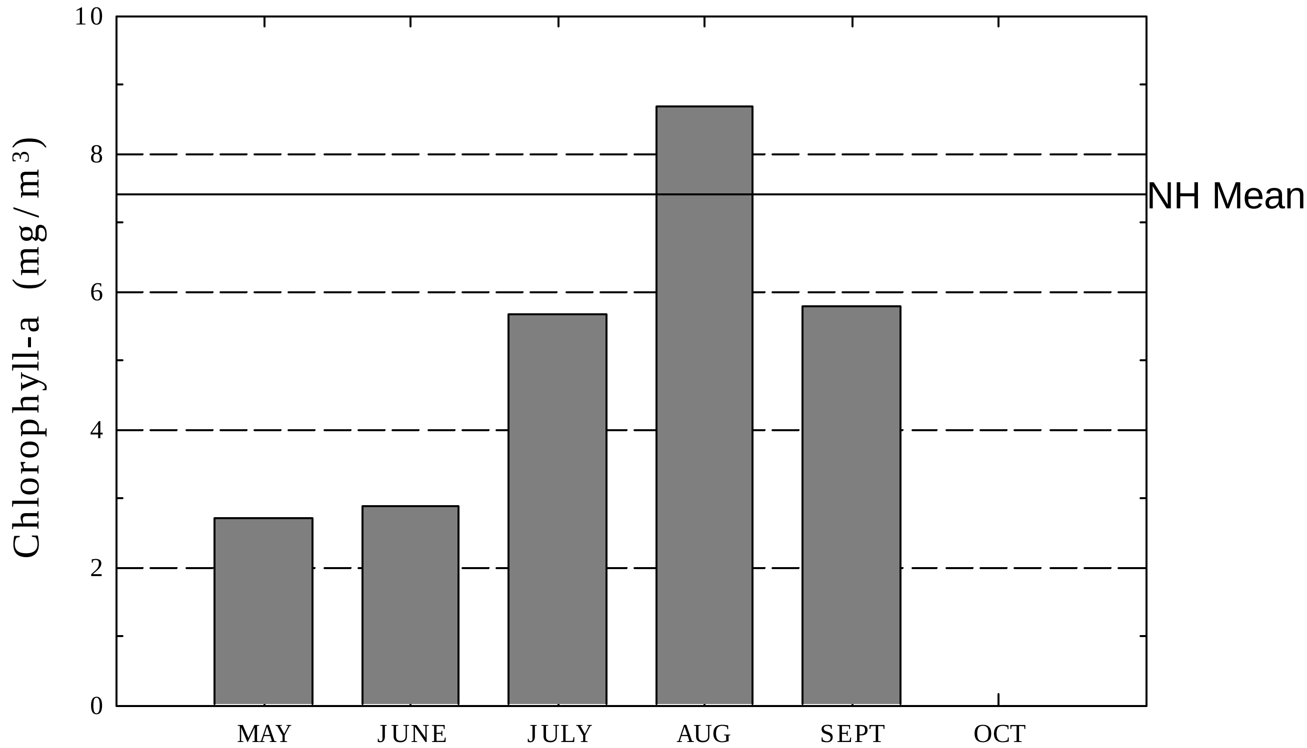
Septic Systems and Your Lake's Water Quality, WD-BB-11, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Effects of Phosphorus on New Hampshire's Lakes, NH Lakes Association pamphlet, (603) 226-0299 or www.nhlakes.org

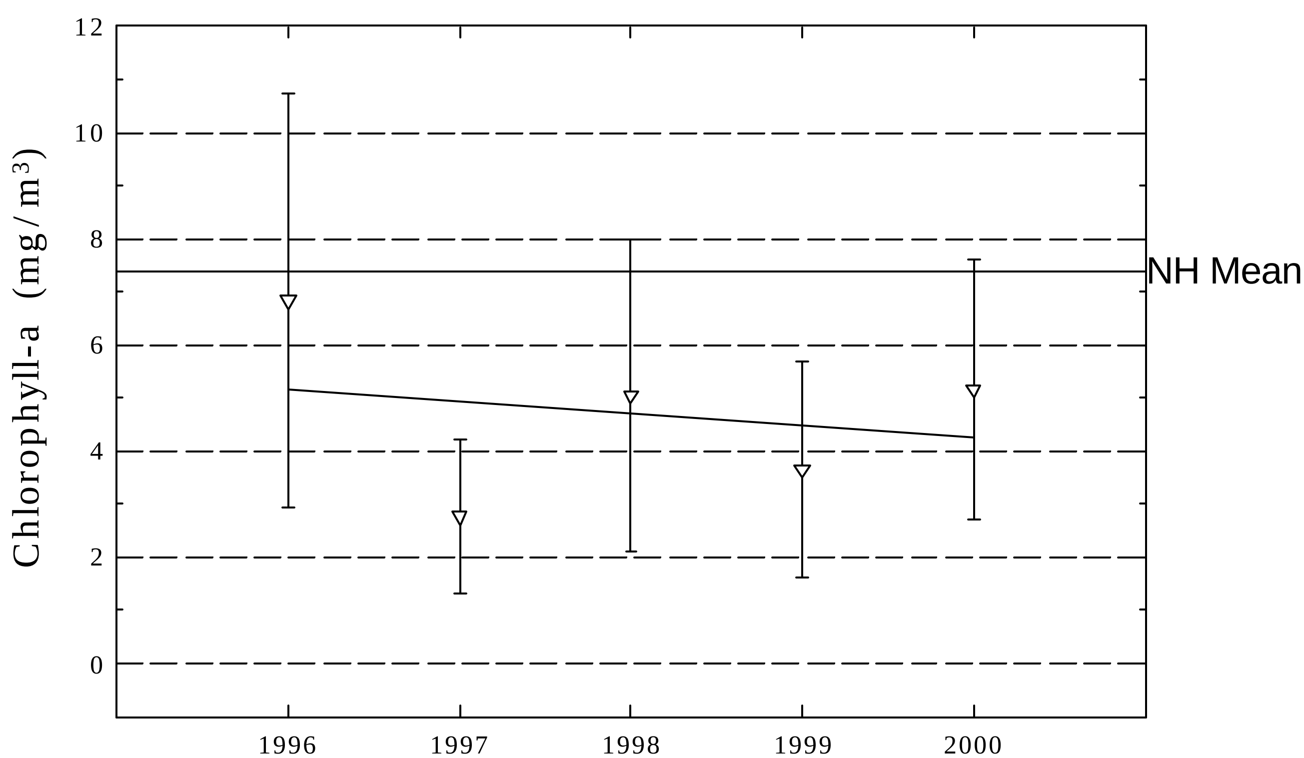
Through the Looking Glass: A Field Guide to Aquatic Plants. North American Lake Management Society, 1988. (608) 233-2836 or www.nalms.org

Messer Pond

Figure 1. Monthly and Historical Chlorophyll-a Results



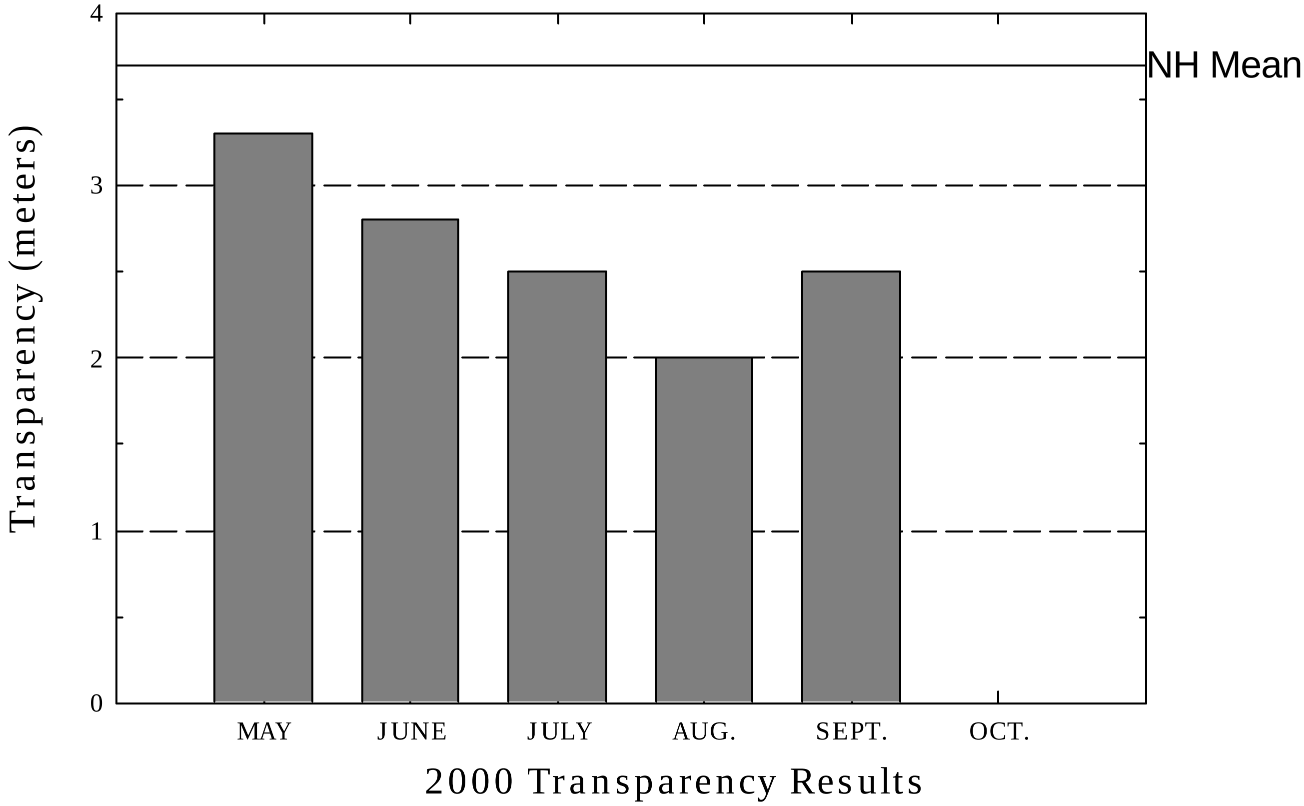
2000 Chlorophyll-a Results

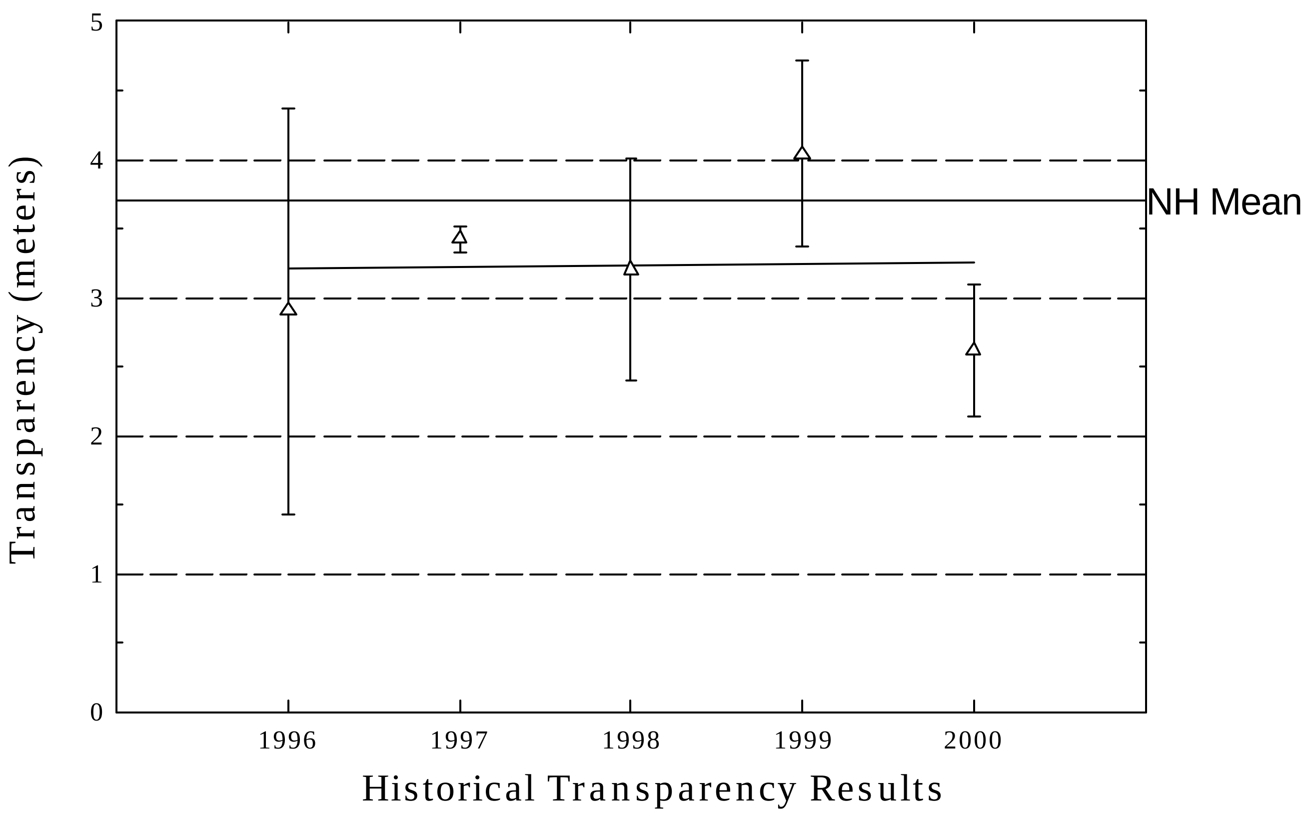


Historical Chlorophyll-a Results

Messer Pond

Figure 2. Monthly and Historical Transparency Results





Messer Pond

Figure 3. Monthly and Historical Total Phosphorus Data.

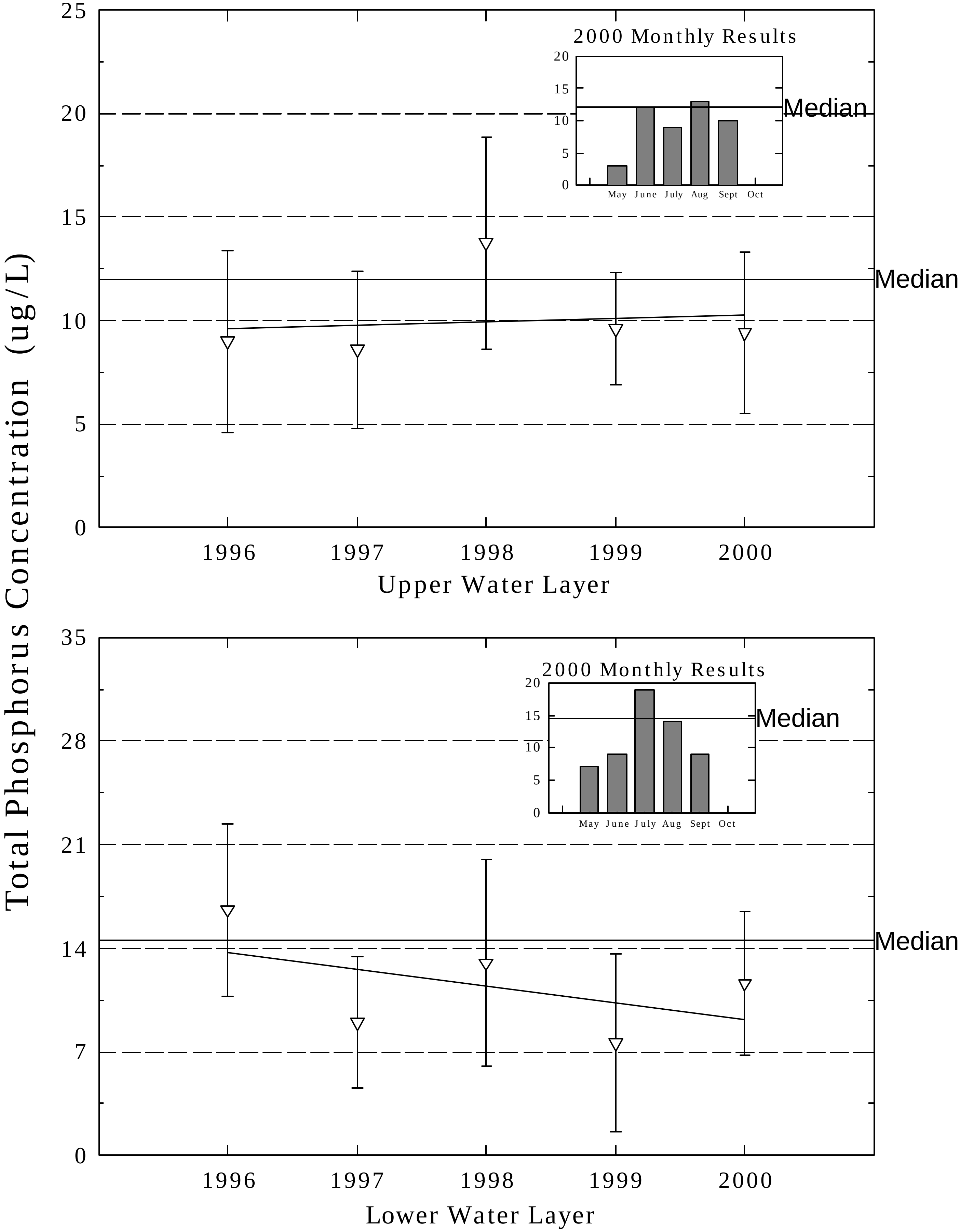


Table 1.

MESSER POND

NEW LONDON

Chlorophyll-a results (mg/m^3) for current year and historical sampling periods.

Year	Minimum	Maximum	Mean
1996	3.11	11.48	6.83
1997	1.23	4.41	2.76
1998	2.41	8.67	5.77
1999	1.07	5.95	3.66
2000	2.73	8.70	5.15

Table 2.

MESSER POND

NEW LONDON

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
05 / 28 / 1996	DINOBRYON	64
	UROGLENOPSIS	24
	ASTERIONELLA	9
07 / 16 / 1996	DINOBRYON	50
	RHIZOSOLENIA	12
	SYNEDRA	9
08 / 18 / 1997	SYNURA	97
	ASTERIONELLA	1
	SPHAEROCYSTIS	1
07 / 07 / 1998	ASTERIONELLA	79
	SYNURA	15
	TABELLARIA	3
07 / 11 / 2000	RHIZOSOLENIA	44
	ASTERIONELLA	32
	DINOBRYON	13

Table 3.

MESSER POND

NEW LONDON

Summary of current and historical Secchi Disk transparency results (in meters).

Year	Minimum	Maximum	Mean
1996	2.0	5.5	2.9
1997	3.3	3.5	3.4
1998	2.5	4.3	3.0
1999	3.0	4.5	4.0
2000	2.0	3.3	2.6

Table 4.

MESSER POND
NEW LONDON

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
BROWN INLET UP				
	1997	5.59	5.81	5.70
	1998	6.31	6.37	6.34
BROWN INLET				
	1996	5.34	6.25	5.69
	1997	5.81	6.19	6.02
	1998	5.79	5.91	5.85
	1999	5.90	5.90	5.90
	2000	5.74	5.96	5.81
COUNTY RD INLET				
	1996	6.02	6.37	6.22
	1997	6.05	6.48	6.21
	1998	6.22	6.87	6.47
	1999	5.86	6.56	6.23
	2000	5.99	6.12	6.07
EPILIMNION				
	1996	3.20	6.67	3.90
	1997	5.75	6.69	6.28
	1998	6.40	6.88	6.66
	1999	6.60	7.17	6.71
	2000	6.37	6.81	6.54

Table 4.

MESSER POND
NEW LONDON

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
HYPOLIMNION				
	1996	5.87	6.78	6.21
	1997	5.75	6.70	6.20
	1998	5.94	6.47	6.13
	1999	6.31	6.62	6.49
	2000	6.03	6.38	6.18
MESSER PD INLET				
	1997	5.55	5.55	5.55
METALIMNION				
	1998	6.67	6.67	6.67
NUTTER INLET UP				
	1997	6.43	6.48	6.45
	1998	6.42	6.51	6.46
NUTTER INLET				
	1996	6.11	6.71	6.39
	1997	6.43	6.61	6.50
	1998	6.42	6.61	6.48
	1999	6.60	6.60	6.60
	2000	6.57	6.73	6.67
OUTLET				
	1996	6.19	6.67	6.48
	1997	6.07	6.65	6.39

Table 4.

MESSER POND

NEW LONDON

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
	1998	6.39	6.75	6.55
	1999	6.39	6.81	6.49
	2000	6.37	6.66	6.52

Table 5.

MESSER POND

NEW LONDON

Summary of current and historical Acid Neutralizing Capacity.
Values expressed in mg/L as CaCO .

Epilimnetic Values

Year	Minimum	Maximum	Mean
1996	4.50	7.10	5.47
1997	0.50	5.10	3.80
1998	4.90	6.70	5.85
1999	4.90	5.60	5.20
2000	4.40	6.30	5.54

Table 6.

MESSER POND
NEW LONDON

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
BROWN INLET UP				
	1997	268.0	336.0	302.3
	1998	227.0	242.0	234.5
BROWN INLET				
	1996	213.0	330.0	258.6
	1997	264.0	378.0	304.0
	1998	245.0	357.0	282.2
	1999	333.0	333.0	333.0
	2000	290.0	331.0	304.0
COUNTY RD INLET				
	1996	62.4	90.4	74.6
	1997	72.0	102.7	83.1
	1998	88.6	113.5	99.0
	1999	102.0	152.4	133.6
	2000	85.7	110.5	94.7
EPILIMNION				
	1996	82.5	279.0	126.4
	1997	114.0	117.0	115.7
	1998	104.3	140.4	119.0
	1999	143.9	152.5	148.8
	2000	81.4	126.5	110.0
HYPOLIMNION				
	1996	81.7	91.6	88.3
	1997	113.0	117.1	115.4

Table 6.

MESSER POND
NEW LONDON

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
	1998	119.4	138.3	127.5
	1999	142.9	152.2	148.1
	2000	96.1	124.6	114.3
MESSER PD INLET				
	1997	106.0	106.0	106.0
METALIMNION				
	1998	141.6	141.6	141.6
NUTTER INLET UP				
	1997	168.0	277.0	213.7
	1998	103.2	124.4	113.8
NUTTER INLET				
	1996	119.8	179.0	153.5
	1997	177.0	282.0	215.5
	1998	125.2	183.4	152.2
	1999	191.8	191.8	191.8
	2000	134.3	289.0	195.4
OUTLET				
	1996	82.3	91.5	87.9
	1997	113.0	117.3	115.5
	1998	102.6	138.0	121.2
	1999	146.6	153.8	148.5
	2000	111.7	121.3	116.5

Table 8.

MESSER POND
NEW LONDON

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
BROWN INLET UP				
	1997	9	112	43
	1998	4	4	4
BROWN INLET				
	1996	53	84	71
	1997	27	763	313
	1998	24	190	70
	1999	35	35	35
	2000	8	88	54
COUNTY RD INLET				
	1996	5	20	15
	1997	10	22	17
	1998	13	26	18
	1999	9	33	20
	2000	4	18	11
EPILIMNION				
	1996	4	14	9
	1997	4	13	8
	1998	7	19	13
	1999	7	13	9
	2000	3	13	9
HYPOLIMNION				
	1996	10	22	16
	1997	4	16	9

Table 8.

MESSER POND
NEW LONDON

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
	1998	6	20	13
	1999	2	17	7
	2000	7	19	11
MESSER PD INLET				
	1997	12	12	12
METALIMNION				
	1998	15	15	15
NUTTER INLET UP				
	1997	41	68	50
	1998	38	53	45
NUTTER INLET				
	1996	21	60	42
	1997	25	61	40
	1998	30	56	40
	1999	31	31	31
	2000	4	53	31
OUTLET				
	1996	9	40	18
	1997	4	24	10
	1998	8	16	10
	1999	7	11	8
	2000	5	10	7

Table 9.

MESSER POND
NEW LONDON

Current year dissolved oxygen and temperature data.

Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
July 11, 2000			
0.1	21.4	7.5	85.2
1.0	21.3	7.5	84.3
2.0	21.2	7.4	83.7
3.0	21.1	7.2	81.4
4.0	15.4	2.1	20.6
5.0	12.6	0.4	4.2

Table 10.

MESSER POND

NEW LONDON

Historic Hypolimnetic dissolved oxygen and temperature data.

Date	Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
May 28, 1996	4.0	10.1	1.9	16.0
July 16, 1996	7.0	8.0	0.4	3.0
July 7, 1998	6.0	13.2	1.5	14.0
July 13, 1999	6.5	12.9	9.7	92.0
July 11, 2000	5.0	12.6	0.4	4.2

Table 11.

MESSER POND
NEW LONDON

Summary of current year and historic turbidity sampling.
Results in NTU's.

Station	Year	Minimum	Maximum	Mean
BROWN INLET UP				
	1997	0.5	3.5	1.7
	1998	0.9	1.4	1.1
BROWN INLET				
	1996	6.2	6.2	6.2
	1997	0.7	8.0	4.8
	1998	0.7	2.8	1.6
	1999	2.8	2.8	2.8
	2000	1.4	2.3	1.8
COUNTY RD INLET				
	1996	0.0	0.7	0.4
	1997	0.6	1.9	1.1
	1998	1.0	1.5	1.2
	1999	0.5	2.8	1.1
	2000	0.3	1.3	0.7
EPILIMNION				
	1996	0.6	0.9	0.7
	1997	0.6	0.9	0.7
	1998	0.3	1.1	0.6
	1999	0.4	0.9	0.6
	2000	0.4	0.9	0.7
HYPOLIMNION				
	1996	0.9	2.8	1.5
	1997	0.6	0.8	0.6
	1998	0.7	3.7	1.7

Table 11.

MESSER POND
NEW LONDON

Summary of current year and historic turbidity sampling.
Results in NTU's.

Station	Year	Minimum	Maximum	Mean
	1999	0.4	1.4	0.8
	2000	0.5	1.0	0.7
MESSER PD INLET				
	1997	0.5	0.5	0.5
METALIMNION				
	1998	0.9	0.9	0.9
NUTTER INLET UP				
	1997	0.6	0.9	0.7
	1998	0.7	0.9	0.8
NUTTER INLET				
	1996	1.1	1.1	1.1
	1997	0.8	0.9	0.8
	1998	0.7	1.2	0.9
	1999	0.8	0.8	0.8
	2000	0.6	1.6	0.8
OUTLET				
	1996	0.2	2.6	1.4
	1997	0.5	0.9	0.6
	1998	0.4	1.2	0.8
	1999	0.3	1.3	0.6
	2000	0.2	1.1	0.6

Table 12.

MESSER POND

NEW LONDON

Summary of current year bacteria sampling.
Results in counts per 100ml.

Location	**Date**	**E. Coli** See Note Below
BEAVER HOUSE		
	August 8	2
MESSER ISLAND		
	August 8	1

NOTE: "<" means "less than" and ">" means "greater than"